

AD-A234 001

2

**The Charge of the Light Brigade:
-- Integrating Heavy and Light Forces
for Offensive Desert Operations**

**A Monograph
by
Major Steven W. Senkovich
Infantry**



**School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas**

First Term AY 89-90

Approved for Public Release; Distribution is Unlimited

90-3176

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
2. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release; distribution unlimited	
4. CLASSIFICATION / DOWNGRADING SCHEDULE			
5. FORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION Tool of Advanced Military Studies, USAC&GSC	6b. OFFICE SYMBOL (If applicable) ATZL-SWV	7a. NAME OF MONITORING ORGANIZATION	
7b. ADDRESS (City, State, and ZIP Code) Fort Leavenworth, Kansas 66027-6900		7b. ADDRESS (City, State, and ZIP Code)	
8a. NAME OF FUNDING / SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
10. SOURCE OF FUNDING NUMBERS			
		PROGRAM ELEMENT NO.	TASK NO.
		PROJECT NO.	WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
In Charge of the Light Brigade -- Integrating Heavy and Light Forces for Offensive
Desert Operations (U)

12. PERSONAL AUTHOR(S)
J (P) Steven W. Senkovich, USA

13a. TYPE OF REPORT Monograph	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 90/1/5	15. PAGE COUNT 59
----------------------------------	--	---	----------------------

16. SUPPLEMENTARY NOTATION

COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	
			desert warfare British tank-infantry doctrine-WWII
			heavy-light operations light infantry
			Arab-Israeli Wars National Training Center

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This monograph examines the feasibility of cross-attaching heavy and light forces for the conduct of offensive desert operations. Cross-attaching heavy and light forces is not a new concept, but current U.S. Army doctrine in this area is shallow. Furthermore, most current discussion and studies concerning heavy-light operations are centered around a central European defensive scenario. The purpose of this monograph is to examine the employment of heavy-light forces in a more probable context; the volatile Middle East/Southwest Asian region.

To better understand what makes the desert a unique battlefield, the monograph first surveys the geography of the desert to illustrate its complex nature. Its military characteristics are examined to determine just how its varied terrain influences the suitability of each type force for desert warfare. (continued on reverse side)

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT UNCLASSIFIED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL J (P) Steven W. Senkovich		22b. TELEPHONE (Include Area Code) (913) 684-2132	22c. OFFICE SYMBOL ATZL-SWV

Item 19 cont.

Since the U.S. Army's desert warfare experience is relatively limited, it is more useful to examine, from a historical perspective, the experience of armies with an extensive background in desert operations. Accordingly, the experience of the British Eighth Army in North Africa during WWII and the Israelis during their two most recent conflicts is analyzed. The focus is specifically on how they employed heavy and light forces offensively, and what doctrinal implications their experience has for the U.S. Army.

Before examining current U.S. Army heavy-light doctrine, the monograph examines the capabilities and limitations of our heavy and light forces in the context of a desert environment. Next, considerations and special concerns for cross-attaching heavy and light forces are discussed, to include the difficulties in synchronizing these type of operations. Finally, the salient lessons learned from the National Training Center over the course of nine heavy-light rotations are highlighted with respect to the battlefield operating systems.

The monograph concludes that a heavy-light mix for offensive desert operations is a viable concept. Both the British and Israeli armies had to resort to them in order to accomplish tactical missions, even if on an ad hoc basis. The complex terrain of the desert requires a flexible, tailorable force. A heavy-light mix provides the synergistic effect necessary for offensive operations that neither force by itself could achieve. But U.S. Army doctrine for these type of operations is generally conceptual, with noticeable shallowness above the battalion level.

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Steven W. Senkovich

Title of Monograph: The Charge of the Light Brigade:
Integrating Heavy and Light Forces
for Offensive Desert Operations

Approved by:

D.O. Hendricks Monograph Director
LtCol Douglas O. Hendricks, MA

William H. James Director, School of
Colonel William H. James, MA, MMAS Advanced Military
Studies

Philip J. Brookes Director, Graduate
Philip J. Brookes, Ph.D. Degree Program

Accepted this 26th day of March 1990



A-1

ABSTRACT

THE CHARGE OF THE LIGHT BRIGADE--INTEGRATING HEAVY AND LIGHT FORCES FOR OFFENSIVE DESERT OPERATIONS by MAJ Steven W. Senkovich, USA. 58 pages.

This monograph examines the feasibility of cross-attaching heavy and light forces for the conduct of offensive desert operations. Cross-attaching heavy and light forces is not a new concept, but current U.S. Army doctrine in this area is shallow. Furthermore, most current discussion and studies concerning heavy-light operations are centered around a Central European defensive scenario. The purpose of this monograph is to examine the employment of heavy-light forces in a more probable context; the volatile Middle East/Southwest Asian region.

To better understand what makes the desert a unique battlefield, the monograph first surveys the geography of the desert to illustrate its complex nature. Its military characteristics are examined to determine just how its varied terrain influences the suitability of each type force for desert warfare.

Since the U.S. Army's desert warfare experience is relatively limited, it is more useful to examine, from a historical perspective, the experience of armies with an extensive background in desert operations. Accordingly, the experience of the British Eighth Army in North Africa during WWII and the Israelis during their two most recent conflicts is analyzed. The focus is specifically on how they employed heavy and light forces offensively, and what doctrinal implications their experience has for the U.S. Army.

Before examining current U.S. Army heavy-light doctrine, the monograph examines the capabilities and limitations of our heavy and light forces in the context of a desert environment. Next, considerations and special concerns for cross-attaching heavy and light forces are discussed, to include the difficulties in synchronizing these type of operations. Finally, the salient lessons learned from the National Training Center over the course of nine heavy-light rotations are highlighted with respect to the battlefield operating systems.

The monograph concludes that a heavy-light mix for offensive desert operations is a viable concept. Both the British and Israeli armies had to resort to them in order to accomplish tactical missions, even if on an ad hoc basis. The complex terrain of the desert requires a flexible, tailorable force. A heavy-light mix provides the synergistic effect necessary for offensive operations that neither force by itself could achieve. But U.S. Army doctrine for these type of operations is generally conceptual, with noticeable shallowness above the battalion level.

Table of Contents

	Page
I. Introduction	1
II. The Geography of the Desert Battlefield	5
III. Historical Perspectives	
The British Experience.	8
The Israeli Experience.	14
IV. U.S. Army Heavy Forces: Capabilities and Limitations	22
V. U.S. Army Light Forces: Capabilities and Limitations	25
VI. Considerations for Integrating Heavy-Light Forces. . .	31
VII. Lessons Learned from the National Training Center. . .	37
VIII. Conclusion	39
Maps:	
A. Mojave - Sinai Desert	41
B. Operation Crusader - North Africa	42
C. Bardia: Plan of Attack, Phases 1 and 2.	43
D. Bardia: 31 Dec - 2 Jan.	44
E. Golan Heights: IDF Counterattack.	45
F. Southern Front: Israeli Canal Crossings	46
G. Lebanon: Israeli Invasion Routes.	47
Endnotes	48
Bibliography	55

I. Introduction

"The Army of the 1990's must be versatile, deployable, and lethal."

General Carl E. Vuono¹

The U.S. Army has a mandate: it must be prepared to fight and win in divergent locations and in a wide variety of situations worldwide to meet national security objectives. Our opponent's military capabilities may range from the heavily armored forces of the Warsaw Pact in Central Europe, to similarly organized Soviet clients in the Middle East or northeast Asia. We may also face lighter, but nonetheless well equipped Soviet surrogates in Central America, southeast Asia, or Africa.²

Although the perceived threat to the U.S. and its allies is greatest in areas contiguous to the USSR, the U.S. Army is more likely to face a Soviet or Soviet sponsored threat in some other part of the world.³ At the lower end of the spectrum of conflict, the Soviets have repeatedly demonstrated their willingness to project their influence through allies or surrogate forces in low-intensity conflicts in the Third World.⁴

Because of these extensive worldwide commitments and potential contingencies, establishing an appropriate force structure has become an increasingly difficult challenge.⁵ A contributing factor to this problem is the context-specific approach the Army has used in its force development. This paradigm incorporates essentially two scenarios spanning the spectrum of conflict. At one end, our modernized heavy divisions stand ready to deter a Soviet threat in Central Europe, while at

the other end of the spectrum, our light infantry divisions (LID) orient on threats in the Third World, the so-called "low-intensity" conflict.⁶ This context-specialization, however, has reduced our flexibility.

Achieving flexibility, according to FM 100-1, The Army, "... requires that...no major unit be limited by organization, training, or equipment to operations in a specific area or under special conditions."⁷ But our forces are in fact limited by their design. On one hand, our heavy forces are admittedly too cumbersome for responsive inter-theater deployments elsewhere. The LID, then, is our strategically flexible response; and it must be capable of both deterrence and combat, if required. But is the LID, by itself, a credible deterrent?

Attempting to answer that question has evoked much controversy in professional journals and other forums. Most of the debate centers around the issue of how to make the LID more "fightable" across the spectrum of conflict. The consensus of opinion, though, is that attempts to "thicken" the LID by augmenting it with heavier weapons and equipment would only negate its strategic deployability, making it less context-adaptable.⁸ There is an alternative, however, to "thickening" the LID, and that is to cross-attach light and heavy forces to fight as an integrated force. Reinforcing that concept, General Vuono recently stated, "combat across the spectrum...usually requires a mix of heavy, light and special operations forces."⁹

But, the Army's doctrine for heavy-light operations is not

well developed, and continues to evolve.¹⁰ Unfortunately, most studies and discussion on heavy-light operations examine their utility in NATO. This myopic view, however, ignores global realities, as the likelihood of a conflict in Europe diminishes almost daily.¹¹ Furthermore, the threat in Europe is but one facet of the spectrum of conflict. Acknowledging this fact, General Vuono reminds us "... we cannot overlook the threats to our vital interests outside the NATO area."¹² And it is on the so-called "periphery" that our attention has been riveted for the past decade.

Within the span of a few months in 1979, Islamic revolutionaries deposed America's principal strategic ally in Southwest Asia, the Shah of Iran, and the Soviets had invaded Afghanistan. The ominous spectre of a Soviet coup de main in the Persian Gulf became a distinct possibility. As military planners examined options for projecting U.S. forces into the region, they came to a stark realization. The U.S. was strategically unprepared to quickly deploy a significant combat force into the Persian Gulf and its environs.¹³

The U.S. response which eventually emerged was a conventional ground strategy based on a combination of light and heavy divisions. Planners dubbed the operational concept for this force the "Zagros Strategy," because it envisioned the employment of light forces in the Zagros Mountains and heavy forces operating in the open deserts in southern Iran.¹⁴ Despite the recent withdrawal of Soviet troops from Afghanistan,

threats to U.S. strategic interests in the Middle East/Southwest Asia have not diminished. Regional anti-Western sentiments, endemic local conflicts, and the Arab-Israeli dispute have kept the area in almost constant turmoil. And because of the vital U.S. interests at stake in this region, local conflicts are more likely than other regions to involve the U.S. and Soviets.¹⁵

If U.S. Army forces are committed to the region, it will most likely be, as General Vuono stated, a mix of heavy and light forces.¹⁶ This raises an important question then; are our heavy and light forces prepared for combined operations in a Middle East/Southwest Asia contingency? If so, in what configuration? Light-heavy or heavy-light? Further complicating the issue is the relative paucity of doctrine for heavy-light operations. The most noticeable shortfall in doctrinal publications concerns employment of light forces in mid-to high-intensity war above the battalion level.¹⁷ In addition, very little discussion has been devoted to heavy-light desert operations, a scenario that appears more probable when compared to other contexts.

The purpose of this paper, then, is to determine the feasibility of conducting heavy-light offensive operations in the desert. To address the issue, this monograph will first examine the military characteristics of the desert battlefield to learn why it is unique. We also need to examine how other armies with extensive desert warfare experience fared in that environment; the British and Israelis specifically. Before examining the feasibility of heavy-light desert operations, we must first

determine what capabilities and limitations our heavy and light forces have. Only then can we begin to examine how to employ them together, and review lessons from practitioners of "desert warfare" at the National Training Center (NTC).

II. Geography of the Desert Battlefield

"A fortress to he who knows it; the grave of him that does not"

Bedouin adage¹⁸

The Middle Eastern desert has historically been an inhospitable field of battle. Availability of water is a constant problem; yearly rainfall is measured in single digits. Winds are hard, unpredictable, and may blow for days at a time, wreaking havoc on man and machine alike.¹⁹ In high summer, noon temperatures in the Sinai may exceed 130 degrees Fahrenheit and still plummet as much as 72 degrees at night.²⁰

Desert terrain is as varied and complex as the climate. The rugged granite mountains in the southern Sinai or Zagros Mountains contrast sharply with the arid flat plains of the Horn of Africa.²¹ Comprising up to one-fifth of the earth's surface and expanding, deserts in the Middle East fall into three general categories: the hamada or rocky plateau is relatively flat, but contains numerous deep erosion ditches called wadis. The hamada is found in most parts of the Western Desert of North Africa and in the Golan Heights. By contrast, soldiers training at the National Training Center (NTC) at Ft. Irwin, California, are operating in a mountain and basin desert combination, commonly

referred to as a great basin. Although separated by thousands of miles, the Mojave Desert in California is very similar to the southern Sinai desert. (MAP A) The mountains are rocky, jagged and cut by deep canyons and washes which merge into alluvial fans. These fans project from the mountains down into basins in the Mojave Desert, or into the Red Sea in the Sinai. The last general type of desert is the sandy or dune desert found in most parts of the Sahara Desert and Empty Quarter of Saudi Arabia. There, sand dunes are widely separated and are constantly being reshaped by the wind.²²

Although desert terrain is indeed varied and unfamiliar, as a general rule, fundamental tactical principles still apply. The uniqueness of the desert terrain, nevertheless, does warrant an analysis using the traditional mnemonic OCOKA:

- Observation and fields of fire: much of the desert is flat allowing direct-fire weapons to engage targets out to their maximum effective range.²³ For weapon systems without a range finder, estimating range will be very difficult and may require emplacement of man-made reference points.²⁴

- Cover and concealment: both are very limited; mechanized forces, however, can achieve terrain masking by driving in the wadis. Similarly, light infantry forces can also use the wadis, or better yet, take advantage of available compartmented, mountainous terrain. In either case, limited visibility provides the most concealment for light forces and therefore, they should only attempt to maneuver at night.²⁵

- Obstacles and movement: British soldiers fighting in North Africa during World War II found the going on the hamada such that "... tanks and trucks could motor almost anywhere."²⁶ But the hamada is only one part of the desert complex and heavy forces will find tactical mobility restricted in the deep dunes, salt marshes, mountains and wadis. This is the domain of light infantry.

- Key terrain: desert warfare is primarily force oriented, but control of certain terrain features has proven decisive. On the North African hamada, a seemingly insignificant knoll, nicknamed "The Snipe," marks the spot where a British infantry battalion literally stopped an Axis counterattack in its tracks, destroying an estimated 50 tanks.²⁷

- Avenues of approach: much of the desert is one huge corridor, but forces can achieve locational surprise by traversing restricted terrain. In the 1956 Sinai campaign, the Israeli 9th Infantry Brigade (Mechanized) captured the Egyptian strongpoint guarding the Straits of Tiran., after advancing 150 miles over "impassable" camel trails.²⁸

Although these terrain considerations appear rather obvious, most mechanized armies have failed to fully consider METT-T for desert warfare; the Deutches Afrika Korps being the singular exception. A proper METT-T analysis would have revealed that a combined arms organization is essential, and it must take light infantry into consideration. This point can perhaps be best illustrated from a historical perspective.

According to the noted historian Jay Luvaas, "serious soldiers have essentially learned their grim trade in one of two ways - from their experience or by studying the experience of others."²⁹ In that vein, we shall examine the experiences of two armies in particular, the British and Israeli. Although they were ultimately victorious, both armies suffered serious setbacks in the process. But it was not attributable to their fighting abilities or equipment; it was because both armies failed consistently, with a few notable exceptions, to properly integrate their tank and light infantry forces. When they did, however, they prevailed.

III. Historical Perspectives

The British Experience

"The desert suits the British, and so does fighting in it. You can see your man."

Field Marshal Viscount Slim ³⁰

The British have been fighting in Middle Eastern deserts since the Crusades, but World War II was their first experience at large scale mechanized desert warfare. The North African Desert became a battlefield for the British in the Second World War because it formed the western flank of the British strategic defense of the Middle East. The region was a vital strategic interest then for the same reason as today: oil. Without access to the oil reserves in Iraq and the Persian Gulf, the British war machine would have been paralyzed. Control of the Suez Canal was

also of strategic importance primarily because of the access it provided to the oil fields. And it was through the North African desert that the Axis advance would have to cross to reach the Suez Canal.³¹

Writers have cited the British experience in North Africa in various studies to prove the feasibility of light infantry operations in a desert environment; the 9th Australian Infantry Division's defense at Tobruk in particular.³² But the 9th Australian was a motorized division and heavily reinforced with antitank units and an armored brigade. More importantly, though, light infantry, is best employed in offensive roles. Accordingly, we should devote our study to light infantry in the attack. Finding examples of successful British heavy-light offensive operations, however, is rather difficult.

The primary reason is that the British in World War II were not practitioners of combined arms operations as we know them. This doctrinal weakness was perpetuated by the British view of warfare in the Western Desert, which they likened to naval warfare. This perception reinforced the "... post-blitz-krieg British conclusion that the key to modern land operations must be large-scale tank-to-tank battles. The place of infantry was largely ignored."³³ There were notable exceptions, though. General Sir Richard O'Connor and Field Marshal Sir Claude Auchinleck, among the most prominent. During his tenure as Commander-in-Chief, Middle East, Auchinleck studied the lessons from Operation Crusader and found "... the British armour,

artillery and infantry had been unsuccessful in concerting their action on the battlefield."³⁴ Accordingly, Auchinleck directed that the "pure" divisions composed entirely of armor or infantry brigades be reorganized into a combined arms task force. Armored brigades, for example, would now consist of three tank regiments, plus a motorized infantry battalion and an antitank regiment. Infantry brigades were reinforced with anti-tank regiments, and divisions were then reorganized around these combined arms brigades.³⁵

Auchinleck's "radical" reorganization, however, did not endure. After the fall of Tobruk to Rommel, Churchill reorganized the British Middle East Command in a compromise decision with his generals. He relieved Auchinleck and replaced him with Montgomery. Although he reaped many accolades for the campaign, Montgomery came close to losing the famous battle of Second Alamein. Critics blame the near failure on the "... cumbersome two-tiered organization of infantry and armor" that Montgomery employed.³⁶ The British were never able to fully overcome these parochial attitudes; and their army remained essentially "... two separate services, trained and organized in different ways, and split asunder by sectional pride."³⁷

By way of contrast, the British capture of Bardia, an isolated action in the British Second Libyan Campaign, provides an excellent example of a well planned and synchronized tank-infantry attack.³⁸ In this particular battle the infantry had the main effort, with armor forces in support, i.e., a light-heavy

arrangement.

The British Eighth Army, then under Lieutenant General Neil M. Ritchie, was on the offense in Libya for the second time. This campaign would last from November, 1941 until January, 1942. The British XXX Corps was attacking toward Tobruk to destroy the Axis forces between the frontier area and Tobruk. Meanwhile, XIII Corps was making a supporting attack to contain the Axis forces in the fortified triangle Bardia-Sidi Omar-Halfaya Pass. (MAP B)

Under increasing pressure, Rommel pulled his armored divisions west to El Agheila, leaving the Axis positions in the triangle intact, forming a pocket. Although it posed no immediate threat, the axis position blocked the only coast road, Eighth Army's line of communications to Tobruk. XIII Corps, under Lieutenant General A. R. Godwin-Austen, had responsibility for reducing the pocket, and he assigned the mission to the 2d South African Division, then in corps reserve.³⁹

Although classified as motorized on paper, the newly organized 2d South African Division suffered from an acute shortage of transport, and was shuttled around to fight dismounted. The division was made up of two infantry regiments, one field artillery regiment, and a cavalry regiment of armored cars and only four tanks. Because of the unique nature of the objective, XIII Corps augmented the division with two battalions of "I" tanks from the 1st Army Tank Brigade.⁴⁰

Bardia was a formidable objective by any standard. The main

fortifications ran along a semi-circular perimeter, with a radius of 4-5 miles, and stretching nearly 20 miles in length. Bardia was also surrounded by a plateau on three sides and the Gulf of Salum to the east. Protecting the landward approaches were twelve-foot wide barbed wire barriers and a five to nine-foot deep tank ditch running the length of the perimeter. The position itself was a veritable fortress, containing 90 individual concrete hardened strongpoints, each protected by wire obstacles, tank ditches, and minefields. Every antitank gun position was hardened and covered by at least two machinegun positions.⁴¹

British intelligence estimated that 4,840 Axis troops were defending the fortress: their estimate, though, was off by 40%. The South Africans were up against 8,500 German and Italian defenders, commanded by Major General Artur Schmitt, former Chief of Staff, Panzergruppe Afrika.⁴²

After extensive planning, division headquarters issued the operations order on 24 December, followed soon after by three days of intensive rehearsals. Tank-infantry and infantry-engineer team drills received particular emphasis to ensure precise synchronization. The division then conducted a full-scale rehearsal on 29 December.⁴³

Because of the sheer size of the objective, the division commander's intent was to reduce Bardia in three phases. (MAF C) The first two phases would rupture the perimeter and reduce the strongpoints; the third phase would consist of mopping up. The

main attack would be from the south, since the best tank approaches were on the western side, and this is where the enemy naturally had most of his AT guns sited.

This operation would be a classic "set piece" infantry attack, supported by tanks and the greatest concentration of artillery yet seen in the theater; 136 tubes in all.⁴⁴ H-hour would be 0500 hours, 31 December. A chronological sequence (in minutes) follows:

H-185: engineer teams accompanied by two infantry battalions began movement to attack positions near the LD.

H-135: the artillery preparation commenced, supported by naval gun fire; engineer-infantry teams moved forward to the wire.

H-110: the engineers began blowing six 30 foot-wide gaps in the wire and caving in the sides of tank ditches; infantrymen passed through gaps in the wire and formed a salient 400 yards inside the perimeter.

H-hour: the first wave of tanks arrived at their appointed gaps, only 30 seconds off schedule, passed through the gaps and began their attack.⁴⁵

By 1100 hours on 31 December, the infantry had formed a hasty defense just short of their original Phase 1 objective, their left flank checked by aggressive Axis counterattacks and a blinding sandstorm. (MAP D) Phase 2 commenced the following night at 2200 hours, with the infantry and tanks attacking abreast, using only moonlight for illumination. The intense

fighting would last another day, and on 2 January 1942, Schmitt became the first German general officer to surrender to the Allies in World War II.⁴⁶

At a cost of 183 KIA and only three tanks destroyed, the 2d South African Division had captured 7,775 German and Italian prisoners, fully one-third of the Axis losses for all of Operation Crusader. As a windfall, they also liberated 1,150 British POW's.⁴⁷

The unequivocal success of the 2d South African Division's baptism by fire was a result of their detailed planning, extensive rehearsals, and an integrated organization for combat. Each "arm" was used to offset the vulnerabilities of the other; the tanks attacked the enemy machinegun positions, while the infantry attacked the antitank guns and cleared obstacles. The synergistic effect they achieved allowed them to literally "fight outnumbered and win." The next army in this study also had to fight outnumbered, and it too was ultimately victorious-barely.

The Israeli Experience

"Where, oh where are the good old days of the simple wars when, as the hour of battle approached, the commander got on his white horse, someone blew the trumpet, and off he charged towards the enemy."

Moshe Dayan⁴⁸

The Arab-Israeli Wars are of particular interest because they reinforce several of the basic lessons of World War II, most of which had to be relearned by the Israelis.⁴⁹ Before examining the Israeli doctrinal approach to desert warfare, a review of the

evolutionary forces involved is worthwhile. The Israelis have established a well-deserved reputation as practitioners of mobile warfare, with a "systems intensive" approach to tactical doctrine. Not surprisingly, therefore, defining the role of the infantryman vis-a-vis the tank has been "one of the most serious problems facing the Israeli Defense Force (IDF) since the War of Liberation."⁵⁰ Before the 1956 Sinai Campaign, the Israelis employed their tanks primarily in an infantry support role, and normally attached a company of tanks to each mechanized (M-3 half-track) infantry battalion.⁵¹

But their experience in the 1956 Sinai Campaign changed this view, and the IDF now saw the tank as the best means to combine mobility, mass, and firepower on the battlefield. The heavy armor proponents had won a doctrinal victory and were even successful in converting the "mobile infantry" advocates like Moshe Dayan. The IDF armored corps commander, also the proponent for IDF tactical doctrine, even went so far as to flatly reject the utility of a combined tank-infantry doctrine. He rationalized that massed tanks in the desert did not need infantry protection.⁵² According to Edward Luttwak, the fallacy of this reasoning was that it totally "disregarded the nature of a significant proportion of the terrain".⁵³

The overwhelming success of Israeli arms in the Six Day War of June, 1967, only further reinforced the IDF's emerging "all tank" doctrine. With the notable exceptions of the Golani Brigade, and the Paratroop Brigade that captured Jerusalem, no

infantry brigade was given an operational role. By 1973, the IDF converted almost all their infantry brigades to armor, leaving only three paratroop brigades and the Golani Brigade in light infantry roles.⁵⁴ These four brigades, however, were to play a crucial role in the outcome of the next conflict.

The Yom Kippur War which broke out in October, 1973, caught the Israelis off guard; strategically, technically, and doctrinally. "The 'tanks only' heresy," according to Brigadier Richard E. Simpkin, "finally came home to roost on the east bank of the Suez Canal."⁵⁵ Egyptian infantrymen, armed with Saggars and RPG-7 rockets, had revalidated Rommel's watchword that the most dangerous thing to a tank was still the armed infantryman.⁵⁶ But it was on the northern front in the Golan Heights that the IDF faced its most serious challenge. That setting also provides the student of heavy-light operations a classic example of the misuse of heavy forces in restrictive terrain.

The battle for the Golan Heights was "critical to the very existence of Israel".⁵⁷ Therefore, the IDF's first priority was to defeat the Syrians in the Golan Heights; only then could they turn their attention to the Egyptians in the Sinai. After four days of intense combat, the northern front was eventually stabilized. In order to take the initiative away from the Syrians, though, the Israelis had to counterattack.

The key to the IDF's operational plan was the seizure of two objectives inside the Syrian border; Mazrat Beit Jan and Tel Shams. The capture of these two objectives would be decisive for

several reasons. First, IDF control of them would give the Israelis much needed operational depth; second, the IDF could threaten Damascus with long-range artillery; third, it would demoralize Syria's vacillating allies.⁵⁸

The IDF's 7th Armored Brigade would lead the main attack in the north, anchoring its left flank on Mt. Hermon. The brigade commander divided his force into two maneuver elements: two tank battalions would attack along the northern (left) axis to seize Mazreit Beit Jan; two other tank battalions would attack on the southern (right) flank to capture the main objective of Tel Shams. (MAP E)

At 1100 hours on 11 October, the 7th Armored Brigade began its attack into Syria. Their axis of advance took them through rugged, boulder strewn hills and lava covered plateaus. Initially, both forces made good progress; the task force on the left flank reached its objective, repulsed a Syrian counter-attack, and consolidated its position by 1700 hours on 12 October. The task force on the right flank also advanced steadily and seized several intermediate objectives. Now their final objective, Tel Shams, loomed directly ahead, dominating the Damascus Road.⁵⁹

The lead IDF tank battalion attacked the Syrian position three times, but was beaten back each time by intense fire from Sagger positions concealed among the boulders. The brigade commander then ordered an "end run" around the heights with both battalions, but the rocky terrain proved impassable to tanks. A

last desperate attempt was made. One of the battalion commanders volunteered to infiltrate with eight of his tanks up an obscure trail that led into the rear of the Syrian position. Although he achieved surprise initially, his force was counterattacked in turn; the commander was nearly killed and Sagers knocked out half of his remaining tanks.⁶⁰ Only now did the Israelis admit that this mission was totally unsuited for tanks; their next option was the 31st Parachute Brigade.

The mission was not passed to the paratroopers simply out of necessity; they were the most proficient night fighters in the IDF. And the paratroopers would uphold their reputation at Tel Shams.⁶¹ Following a heavy artillery preparation, the paratroopers attacked with two battalions abreast, supported by one tank company. The Israelis only used illumination during the final assault to clear out the Syrian positions. At a cost of only four men WIA, the paratroopers had captured the heretofore impregnable position.⁶² The road to Damascus was now open.

The Israelis also had to resort to ad hoc heavy-light operations on the Southern Front (Sinai) as well. As a sequel to their counterattack, the IDF commanders envisioned a canal crossing to the west bank, using two division-sized crossing sites just north of the Great Bitter Lake. (MAP F) Although the Israelis were successful in fighting their way to positions just short of the east bank, they were held up by fierce resistance from the Egyptian 16th Infantry Division at the Chinese Farm.⁶³

Both IDF division commanders, Major Generals Ariel Sharon

and Avraham Adan, had parachute brigades attached to their respective divisions. Sharon ordered the "Matt" Brigade to conduct an assault crossing of the canal in rubber boats to secure a bridgehead on the west bank. Matt's paratroopers made the crossing under fire, and established a bridgehead line three miles deep. For two days, the force withstood heavy artillery fire and repeated counterattacks until relieved by armored forces.⁶⁴

Meanwhile, Adan's division tried to open the Akavish-Tirtur road to establish a bridgehead, but Egyptian anti-tank fire from positions inside the Chinese Farm was still too intense. Adan then ordered a parachute battalion from the "Uzzi" Brigade to conduct a hasty night attack to clear out the enemy Sagger and RPG-7 positions.

Within minutes after their arrival, the paratroopers attacked into the labyrinth of irrigation ditches concealing the Egyptians. A desperate battle raged throughout the night. And at one point Adan tried to extract the force, but the paratroopers were decisively engaged with a significant Egyptian force. Nevertheless, the paratroopers were able to suppress enough of the antitank positions to allow the armored units with the bridging equipment to pass behind the screen established by the infantry. The following morning the paratroopers were finally extricated, but they had suffered heavily: 40 KIA and over 30 WIA.⁶⁵

Their losses had not been in vain, though. General Adan

credited the success of the canal crossing in his zone to the paratrooper's actions. After the cease-fire, Adan critiqued the operation and felt the IDF's "... ability to fight continuously and persistently, which we demonstrated by moving in the paratroopers, permitted us not only to transfer the bridging gear, but also to fight more fruitful armored battles on the morning of the seventeenth."⁶⁶ General Adan's words captured the true essence of the synergism achievable by heavy-light operations.

The experience of the 1973 war forced the IDF to reassess their "all tank" doctrine, as it had nearly resulted in disaster. In response, the Israelis set out to develop a more balanced combined arms force.⁶⁷ Ironically, they placed the onus on the artillery to strip away enemy infantry rather than improving the performance of their own infantry. In fact, as the IDF's size increased dramatically from 1973 to 1982, the number of available infantry forces actually declined proportionately.

In 1973 the IDF had 15 mechanized brigades and four parachute brigades; in 1982 it could field 10 mechanized brigades, five parachute brigades, and 12 territoria' guard infantry brigades. In the meantime, the IDF increased overall from six to eleven divisions.⁶⁸ Not surprisingly, then, the IDF would revisit the heavy-light issue during their next major conflict.

The Israeli invasion of Lebanon in 1982 is a classic example of an army that went to war, "prepared for the last war it had

fought".⁶⁹ The Israelis now believed that the ideal force structure was a bigger, heavier army, with significantly more artillery. But they saw no requirement to develop a light infantry capability, neglecting the lessons of Tel Shams. As a consequence, when the IDF advanced up the narrow mountainous approaches to Lebanon's Bekaa Valley, (MAP G) the Syrians took a heavy toll of Israeli tanks and APC's as the cumbersome armored columns wound through the rugged terrain.⁷⁰

For an army with a doctrine based on mobile warfare, this type of combat seriously disrupted their optempo, because the armored infantry had to dismount constantly to clear defiles and ambush sites. Eventually, the Israelis became so frustrated with this type of fighting, they had their engineers cut new roads rather than fight for the existing ones.⁷¹ Once again, the IDF had committed heavy forces to fight in restrictive terrain without light infantry support. Not only were their armored infantry unsuited for sustained combat operations in the mountains, the Israelis also learned that their APC's were "death-traps" in compartmented terrain.⁷² Are we any better prepared than the IDF for this type of combat?

We have more work ahead of us in this area. As noted earlier, our context specialization has reduced our flexibility to adapt to a variety of terrain and threat conditions. Cross attaching heavy and light units is one method of making our forces more context-adaptable, i.e., more versatile. Before examining the feasibility of heavy-light desert operations.

however, it is worth reviewing the unique capabilities and limitations of each force.

IV. U.S. Army Heavy Forces: Capabilities and Limitations

Heavy forces are those mechanized and armored units whose primary mission is to fight a similarly organized enemy on a mid- to high-intensity battlefield. Our heavy forces are organized into either mechanized or armored divisions, each division consisting of three maneuver brigades. A heavy brigade may have either three or four battalions; a three battalion brigade will have either two mechanized and one armor battalions, or one mechanized and two armor battalions. A four battalion brigade has a balance of two mechanized and two armor battalions. The DIVARTY contains a MLRS battery with nine launchers and three 155MM M109 battalions composed of three batteries each. The remaining two major subordinate commands are the DISCOM and the combat aviation brigade, which contains an attack helicopter battalion and the division cavalry squadron.⁷³

The current design for our heavy divisions, Division 86, was based on the requirement to fight a mid- to high-intensity war against Warsaw Pact forces in Central Europe. Using force-on-force computer models, force designers arrived at a "more is better" methodology when it came to the heavy force structure. To that end, our heavy divisions became even heavier, although their tactical mobility actually increased.⁷⁴ In any event, the heavy division is well suited for its intended role.

Heavy forces are best employed in open terrain where they can capitalize on their inherent mobility, protection and firepower to attack and destroy enemy armored forces. They are also especially well suited for exploitation and pursuit roles for the same reasons. In defensive roles, the heavy division's mobility and firepower allow it to fight a mobile defense over substantial distances and still concentrate quickly.⁷⁵ These potent capabilities, while very impressive, have been achieved at the cost of several concessions.

First, the performance of the heavy division is at its optimum level in fully trafficable, open terrain. However, as the terrain's trafficability declines or it becomes compartmented, the mobility advantage of the heavy force diminishes proportionately.⁷⁶ And there is no dearth of untrafficable terrain in Middle Eastern deserts. Furthermore, as the terrain becomes more restricted, the heavy force becomes more vulnerable to antitank fires and is less capable of suppressing them. The terrain at Tel Shams and the Bekaa attest to that.

Although our heavy forces have armored infantry capable of protecting the tanks in restricted terrain, the IDF experience in Lebanon revealed that this arrangement has serious drawbacks. First, having the infantry dismount reduces the tempo of the heavy force significantly. Second, infantry fighting vehicles are very vulnerable to antitank fires. In Lebanon, Israeli paratroopers preferred riding on top of tanks or walking rather than risk riding inside of M-113 armored personnel carriers.⁷⁷

There are additional problems common to all mechanized infantry units, irrespective of terrain; their ability to maneuver dismounted is limited in depth and duration. Depth of maneuver is constrained by the maximum effective range of the fighting vehicle's supporting weapons, while duration is limited by the tactical situation.⁷⁸ As long as the squad is dismounted, the static fighting vehicle is more susceptible to being acquired and engaged by direct and indirect fires, or even air strikes. The mechanized commander has a dilemma. If he disperses his vehicles to reduce their signature, it will take significantly longer for the squads to concentrate to achieve mass. If he does not, he risks destruction.

Mechanized infantry squads also have command and control problems because of their dual configuration, i.e. a fighting vehicle element and a dismount element. First, in determining where the squad leader goes, and second, whether the squad is going to fight with the vehicle under the squad leader's control.⁷⁹ This problem is further exacerbated in U.S. Army heavy divisions because of the inadequate dismounted infantry strength of our M2 Bradley equipped units.

Other related concerns include the squad's limitations in firepower, load carrying capacity, and communications. In Afghanistan, Soviet motorized rifle unit commanders found that when their squads fought dismounted, they quickly exhausted their supply of ammunition, even in short firefights with the Mujahadin guerrillas.⁸⁰

In the context of desert warfare, however, there are more fundamental issues. The demands of dismounted infantry operations in the desert require a high degree of self-reliance, stamina, and resilience. And it was precisely these traits that posed the greatest shortfall for the Israeli armored infantry in Lebanon and the Soviets in Afghanistan. The latter learned painfully that motorized riflemen were not suited for the rigors of mountain desert warfare, and were forced, like the IDF in 1973, to rely on elite light infantry forces (paratroopers and Spetznatz) for most combat missions.⁸¹ The U.S. Army, however, already has a force prepared for the demands of desert warfare.

V. U.S. Army Light Forces: Capabilities and Limitations

"An army can pass wherever a man can set foot."

Napoleon ⁸²

The LID is an offensively oriented, versatile force with unique capabilities that differ significantly from those of heavy forces. It is a small, but strategically responsive and flexible fighting force, organized, equipped, and trained to respond to a wide array of contingencies. Its primary orientation, however, is on fighting other light forces (low-intensity conflict), while retaining utility in other conflict scenarios, when properly augmented. The LID would normally deploy and operate as part of a corps, either contingency or forward-deployed, or as part of a Joint Task Force (JTF). Its most salient characteristic is its rapid deployability; it can be airlifted in approximately 500

C-141 sorties. However, it does not have a forced-entry capability.⁸³

The LID organization includes three maneuver brigades, a DIVARTY, a combat aviation brigade, and a DISCOM. Each brigade consists of three infantry battalions; each battalion in turn is composed of three rifle companies. The DIVARTY is composed of a GS 155MM (M198 towed) battery and three 105MM M119/M102A2 battalions. The combat aviation brigade consists of an air assault battalion, a recon squadron, and attack helicopter battalion.⁸⁴

Light infantry forces capitalize on their ability to negotiate restrictive terrain to infiltrate and attack where least expected. They are relatively difficult to detect because of their small physical, thermal, and electronic signature. This low signature enables the light infantry to achieve surprise in both time and location, attacking from unexpected directions.⁸⁵

Using infiltration tactics, light forces aim specifically at enemy weaknesses to achieve selective, "high leverage destruction". Classic light infantry missions include the destruction of enemy C2 nodes, CSS sites, and other "soft" targets of opportunity.⁸⁶ Under certain METT-T conditions, light forces can successfully defeat heavy forces, as evidenced by the IDF paratrooper's night attack at Tel Shams in 1973. But employment of light infantry requires a keen understanding of their tactics.

Because of time-distance factors, the depth of light

infantry attacks should not exceed 10-15 kilometers beyond the FLOT, since their approach route will normally traverse very rugged terrain. Infiltration attacks of this depth and duration have been successfully conducted at the NTC against an alert OPFOR and in terrain that closely replicates deserts of the Middle East.⁸⁷ However, once the light forces reach their objective, they must accomplish their mission as rapidly as possible. Experience at the NTC has shown that the window for success is only open for 30-60 minutes; much beyond that, their survivability is at risk.

Light forces add another dimension to maneuver; they are ideally suited for conducting air assault operations to seize key terrain or attack enemy forces across the FLOT. During Gallant Eagle 84, conducted at Ft. Irwin, California, Task Force 2-101 was air assaulted at night into objectives in a mechanized enemy's rear. At dawn, the light task force engaged the enemy with TOWs as Task Force 1-24 (Mech) launched a coordinated armor attack, causing the enemy to fight in two directions simultaneously.⁸⁸

Air assault operations are not without risk, however, because they create a definite signature; a secure air corridor is a precondition. During the Yom Kippur War, the Egyptians failed in an attempt to air assault commando forces to seize the Giddi and Mitla passes. Their helicopters flew beyond the ADA umbrella and Israeli high performance aircraft shot down fourteen fully loaded Egyptian transport helicopters.⁸⁹

Despite its versatility, the LID is not a general-purpose force. Its tactical mobility is constrained by a limited amount of organic vehicles and aircraft. Even when consolidated, its assets are only capable of moving two battalions at one time.⁹⁰ And once employed, the LID is primarily a foot-mobile force. But measuring tactical mobility, cautions Brigadier Richard E. Simpkin, in Race to the Swift, is too often confined to wheels and tracks, and focused on terrain where vehicles can operate. In his opinion, "If the meaning of mobility includes versatility and elusiveness, then we can compare the combat worth of a platoon of well-equipped Gurkhas with a troop of main-battle-tanks."⁹¹ In many parts of the desert, where restricted terrain abounds, the light forces will actually be more mobile than their heavy counterparts. This terrain adaptability is significant. "The ability and will to go where the enemy cannot, still more where he thinks you cannot," according to Simpkin, "... is an immeasurable asset."⁹² The LID can obviously "move," but can it "shoot"?

The LID's limited lethality in a mid-to high-intensity conflict is at the heart of a current CACDA assessment, whose charter is to determine ways to increase the LID's lethality without sacrificing its rapid deployability and tactical mobility.⁹³ The low density of infiltratable antiarmor weapons in the LID is at the crux of the problem. A light infantry battalion currently has only four TOW's and 18 Dragons (36 if night-sights are used) to employ.⁹⁴ As an additional

consideration, the TOW-HMMWV could, under certain METT-T conditions, be infiltrated within supporting distance of the rifle companies by "shadowing" them. Otherwise, they should not be considered infiltratable, per se.

Although the operational testing of the Advanced Antitank Weapon System-Medium (AAWS-M) has run into procedural delays, its eventual fielding will reduce this shortfall in the LID's antiarmor capability. If issued on the same basis as the Dragon, the 2,000 meter effective range of the AAWS-M would make it a significant combat multiplier.⁹⁵ Other systems are needed as well to upgrade the LID's lethality.

For starters, the LID should acquire the AN/PAQ-1, laser target designator (LTD). It is a lightweight, 1500 meter range system, which would give the LID the capability to designate Copperhead and ground launched Hellfire missiles.⁹⁶ But there are other armor-defeating systems already in the LID TOE. Each infantry battalion has four 81mm mortars that have the potential to become tank killers. The British Merlin 81mm mortar "bomb", using terminal sub-guided munitions, is capable of engaging targets out to a range of four kilometers, similar to Copperhead.⁹⁷ This same technology could also be applied to each rifle company's 60mm mortars and further enhance the LID's lethality without a corresponding increase in tactical mobility requirements.

Just as heavy forces are more vulnerable to antitank fires in compartmented terrain, light forces are vulnerable to all

types of fire when placed on the wrong type of terrain; they simply lack the protection of armored infantry. Not only must light forces maneuver in restrictive, compartmented terrain, they must stay dispersed and only move during hours of darkness. This is especially true in the desert.⁹⁸

In October 1973, the Egyptian 1st Infantry Brigade had successfully captured the IDF strongpoint at Ayoun Mousa on the east bank of the Suez Canal. The brigade was then supposed to advance that night down the Red Sea coastline to capture Sudr, the nearest significant IDF position. But the brigade commander, flushed with success, moved out several hours before sunset. Within minutes after they had marched beyond their air defense umbrella, the Egyptians were attacked by Israeli high performance aircraft. The brigade was decimated, suffering 90% casualties.⁹⁹

Sustainability is another shortcoming of light forces, and many feel it is the most significant "war stopper".¹⁰⁰ For short duration operations (less than 48 hours), the LID is considered self-sufficient. Beyond this point, however, the LID's ability to resupply itself is very limited, and supply point distribution is out of the question. Even in a LIC environment, the LID will require augmentation in the form of external CS/CSS assets to sustain itself. And in a mid- to high-intensity conflict the requirement for augmentation will multiply proportionately.¹⁰¹ At the root of the sustainment issue is the LID organic CSS structure. Unlike heavy divisions that are supported by a Main Support Battalion/Forward Support Battalion (MSB/FSB) structure,

LID CSS assets are not divisible by three which constrains its flexibility to cross-attach its subordinate units.¹⁰² But why would a light unit ever be cross-attached?

VI. Considerations for Integrating Heavy-Light Forces

"It is not so much the mode of formation as the proper combined use of the different arms which will insure victory." Jomini ¹⁰³

Jomini's maxim is timeless, but not always understood clearly. Heavy-light operations are not a novel or complex concept; they are nothing more than a variant of the combined arms operations concept.¹⁰⁴ The purpose of employing heavy and light forces together is to capitalize on their unique capabilities while offsetting the limitations of the other, achieving a synergistic effect. The easiest way to achieve this synergism is to cross-attach the two different forces.

But heavy and light forces should not be task organized simply because they have the capability to do so; there must be a requirement. Unless the synergistic effect of a heavy-light force is greater than the sum of its parts, there is no benefit in cross-attaching.¹⁰⁵ Synergism, however, does not occur automatically.

In fact, the prevailing trend for heavy and light operations has been to separate the two forces during execution of most tactical missions. This "separate sandbox" syndrome occurs when two forces come together at the final planning stage and again at the conclusion of the operation.¹⁰⁶ The causes behind this

problem may be parochial, but are more likely the result of a lack of understanding of each others capabilities. This was the prevalent problem with the British in North Africa; the armor and infantry units rarely underwent combined training and thus had little understanding of each other's abilities or problems.¹⁰⁷ And observations from the NTC suggest that it is usually the light force that is misunderstood.¹⁰⁸ But this symptom is not the result of a doctrinal void.

FM 100-5, Operations, provides appropriate guidance. The first airland Battle imperative, and in this case most applicable, is "ensure unity of effort."¹⁰⁹ The intent of this maxim is to reduce friction and enhance teamwork. To achieve this unity, we should employ heavy and light forces in a task organization where one force has the main effort; that includes command and control of the other unit. The higher commander, either corps or JTF, makes this decision based on a METT-T analysis. The unit best suited for employment over the majority of the terrain or area of operations, should be given overall command.¹¹⁰ Despite the diversity of terrain in Middle Eastern deserts, the preponderance of it favors heavy forces which suggests that a heavy force will normally have the main effort, with light forces subordinate.

Since habitual relationships have not likely been formed, close cooperation between both units is required. Commanders and staffs of both units should conduct mutual planning; command posts should be collocated; and "liaison among units must be

automatic."¹¹¹ The result should be a task organization with a well-understood, common doctrine, tactics, and techniques.

There are no inviolate rules for cross-attaching heavy and light units, but there are several basic considerations to apply when employing light forces with heavy forces. The corps or JTF headquarters creating the task force needs to address the following issues:¹¹²

-METT-T: what specific mission must the light force must accomplish, and does it directly facilitate the overall plan? What is the threat (heavy-light) and what are they doing? What is the enemy air threat? NBC threat? Does the terrain provide adequate cover and concealment for the light forces? What is the minimum size force required for the mission? Is there adequate time to accomplish the mission at night?

-SUPPORT/MOBILITY REQUIREMENTS: will the light forces need transportation support or additional airlift? What other types of augmentation are required? Will a J-SEAD be required? Fire support-CAS? CSS augmentation?

-DURATION: how long does the heavy force actually need the light force? What is the shortest realistic time to accomplish the mission? As a general rule, light forces should be "pulled" by the heavy force to perform a specific mission and then released back to their parent unit, because light forces need frequent rotation off-line.¹¹³

After analyzing these considerations, the next logical step is to determine the optimum mix of heavy and light forces.

According to General Galvin, "... commanders have often struggled to find the most appropriate mix of forces to accomplish their aims, and that the main ingredients have been contrasting elements-heavy and light."¹¹⁴ As stated before, there are no cardinal rules for task organizing heavy-light forces, but there are preferable options.

In order of preference:

- Light division attached to a corps
- Light brigade attached to a heavy division
- Light battalion attached to heavy brigade
- Light brigade OPCON to a heavy division
- Light battalion OPCON to a heavy brigade¹¹⁵

Yet another consideration, according to FM 71-100, Division Operations, is that light forces should be employed in at least division size. Although the division is employed as an entity, its normal "... method of operation is to disperse widely throughout a large area and conduct synchronized but decentralized operations."¹¹⁶ Doctrine, however, does not always dovetail with the tactical situation.

In his assessment of light infantry employment in a NATO scenario, COL Huba Wass de Czege points out "... rarely will there be enough contiguous 'light infantry country' to employ an entire division in one sector."¹¹⁷ Although he based his observation on a defensive NATO scenario, the principle of terrain adaptability is constant. Wass de Czege concluded, that since the terrain in a division's sector varied so much, "... it

was useful to cross-attach brigades." 118

Based on METT-T, then, a light brigade attached to a heavy division is the preferred option, and most probable. Although the light brigade could be OPCON, this arrangement places an undue burden on the parent organization's already meager CSS resources. It is even possible to cross-attach light battalions to heavy brigades; this has been done routinely at the NTC and during REFORGER 88. But this arrangement should only be done for specific missions, and the employment of light forces below the battalion level should always be avoided. 119

There are two factors involved here. The first is the principle of mass. Light forces must be strong enough to cause the required reaction by the enemy, i.e., an operational pause. The second limiting factor, addressed previously, is structural. Because the LID's CS/CSS assets are so austere, they cannot provide direct support to divergent units in a piecemeal fashion simultaneously.

Additionally, many of the support functions performed at the battalion level in heavy units are consolidated under brigade control in the LID structure, further reducing flexibility. 120 Logistics, however, is only part of the equation for task organizing.

Organization for combat is predicated primarily by the operational role intended for each force. In offensive operations, both heavy and light forces can be either the fixing or maneuvering force. 121 But the mobility factor differentials

between heavy and light forces will normally make the light force an adjunct to a maneuvering heavy force.

In Rommel's view, the primary role of the infantry in the desert "... was to occupy and hold positions designed either to prevent the enemy from particular operations, or to force him into other ones."¹²² With a mix of mechanized and non-mechanized forces, Rommel skillfully integrated them during offensive operations. In his assault on the heavily mined Gazala Line in May, 1942, Rommel used his non-mechanized infantry to fix the British defenders, while his Panzers conducted an envelopment around their flank.¹²³

In addition to its fixing role, the light force can also facilitate the maneuver of a heavy force by allowing it to generate greater momentum. A light force can infiltrate ahead of a heavy force to confirm the IPB, breach obstacles, and neutralize antitank positions covering them. It can also preposition Stinger teams to protect the heavy force along its axis of attack; seize key terrain such as defiles, or other chokepoints, allowing the heavy force to pass through without stopping. It can even block enemy counterattack forces. The impetus behind all these missions is to create conditions which allow the heavy force to maintain a higher tempo of operations.¹²⁴

The key to a successful heavy-light attack, however, is proper synchronization. Heavy-light operations must be well planned and somewhat set-piece to assure a unified effort.¹²⁵ This further reinforces the importance of face-to-face planning

between the two commanders and their staffs, and helps eliminate the "separate sandbox" mindset.

As a minimum, the movement rates of the light infantry must be calculated into the overall scheme of maneuver, and the LD time of the heavy force adjusted accordingly. Additionally, to prevent fratricide, control measures must be infallible and the heavy force commander must always know the location of his light counterpart. With the use of backward planning and rehearsals, the split second timing and synergism that the British forces at Bardia achieved can be replicated.

VII. LESSONS LEARNED FROM THE NATIONAL TRAINING CENTER

Employment considerations for heavy-light forces as discussed previously have been evaluated over the course of nine rotations at the NTC. The emerging trend is that the heavy-light concept for offensive operations in a desert environment is viable. There is room for improvement, though, and the salient issues have been captured within the parameters of the seven battlefield operating systems (BOS).¹²⁶

Synchronization of heavy-light Maneuver forces presents the greatest challenge for brigade/battalion task force commanders and staffs, primarily because of unfamiliarity between units.¹²⁷ To ensure proper timing and synchronization, heavy-light operations must be well planned and to a degree, "set-piece."

Successfully integrating Fire Support has also demonstrated the necessity of close coordination to reduce capability

differentials. Task Force 3-9, 7th ID(L), for example, resorted to collocating fire support elements because they lacked digital interface with the heavy brigade (light forces do not currently have TACFIRE).¹²⁸

Light infantry forces are naked in the desert, and it is very easy to create a signature. Passive Air Defense measures, therefore, must be strictly adhered to. As for active measures, resupply of Stingers for light forces is a recurring problem. Each Stinger team is limited to two missiles unless troopers from the line companies are detailed to carry extra missiles. One task force commander regretted that he did not consider the use of helicopter resupply for Stingers.¹²⁹

Most heavy-light rotations find that the light infantry are an excellent source of HUMINT on the battlefield. Their ability to obtain Intelligence to update the IPB/DST is vital. Furthermore, updating the IPB/DST must be done on a continuous basis, because light forces cannot react as fast as heavy forces to changes in the enemy situation.¹³⁰

With regard to Mobility and Survivability, the light forces are capable of conducting hasty breaches and assaulting the enemy. They can also execute a lengthy breach by themselves, but not both. The biggest survivability concern for the light forces in the offense, however, is their austere NBC protection and decontamination capability.¹³¹

It is Sustainment, however, that has been identified as the "number one war-stopper" for heavy-light operations at the NTC.

In theory, heavy forces should "push" supplies to light forces in LOGPACS, but execution is sometimes flawed because heavy forces do not do this routinely. As a result, they fail to anticipate the light force's requirements. To cite just one example, water consumption by light forces requires extra assets; each trooper requires a minimum of six quarts for a 12-20 kilometer movement.¹³²

Another contributing factor to the synchronization challenge is that of Command and Control; communications between heavy and light forces are difficult because of the limited range of the light force's PRC-77 with Vinson. It has been suggested that the light force commander consider having a command vehicle "shadow" his force to provide a much more powerful transmission capability.¹³³

VIII. CONCLUSION

Not only are heavy-light offensive operations in the desert feasible, they have worked in the past. By contrast, to try to operate in the desert in a pure heavy or light formation is to court failure. The key to success is to adapt the force to the terrain. As the British learned and the Israelis relearned, light infantry has a definite role given the right terrain. Light infantry forces shape the battlefield and create opportunities for the heavy force to exploit. The heavy force can maintain a higher optempo because it does not have to dismount its armored infantry and fight for terrain. Moreover, the employment of the two forces in a synchronized manner

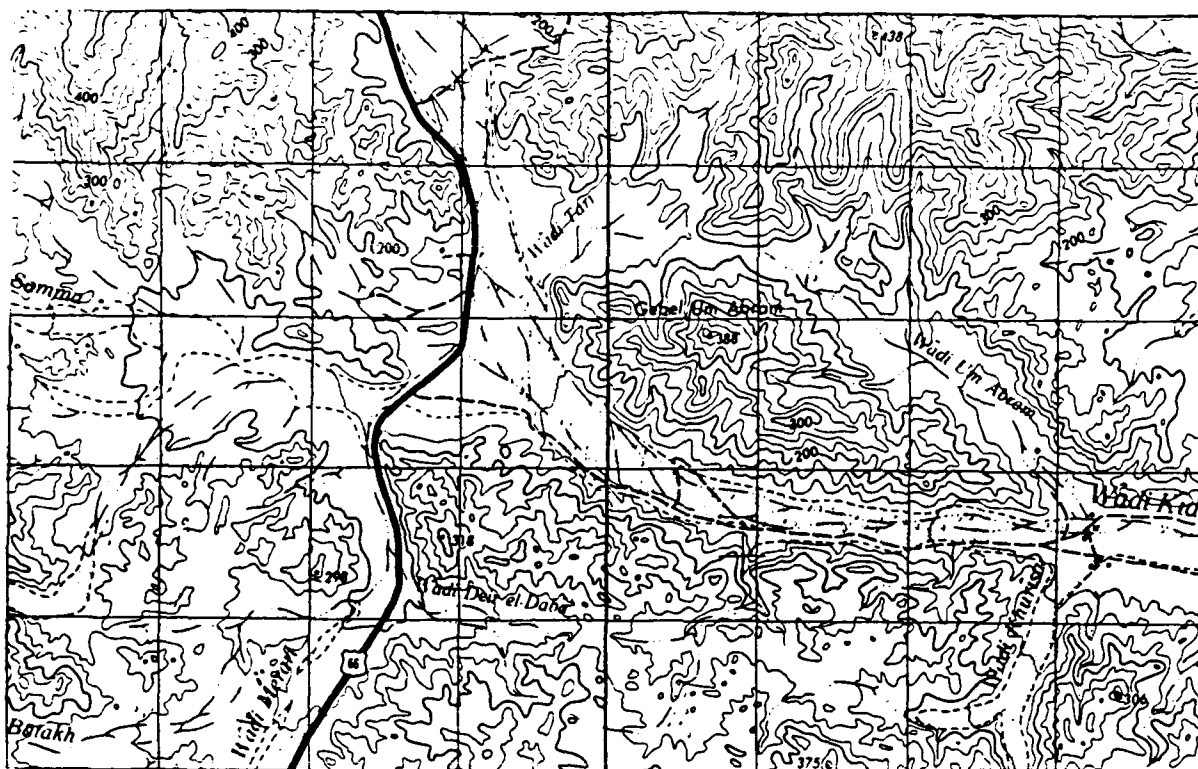
disrupts the enemy defenses and forces him to fight in two different directions, dissipating his combat power.

Many studies are ongoing to find ways to make the light infantry more lethal, but restraint is the watchword; attempts to make the LID more like heavy forces will only negate its inherent advantages of strategic deployability and tactical mobility in rugged terrain. Technique improvement may be more important than augmentation with heavier weapons.¹³⁴

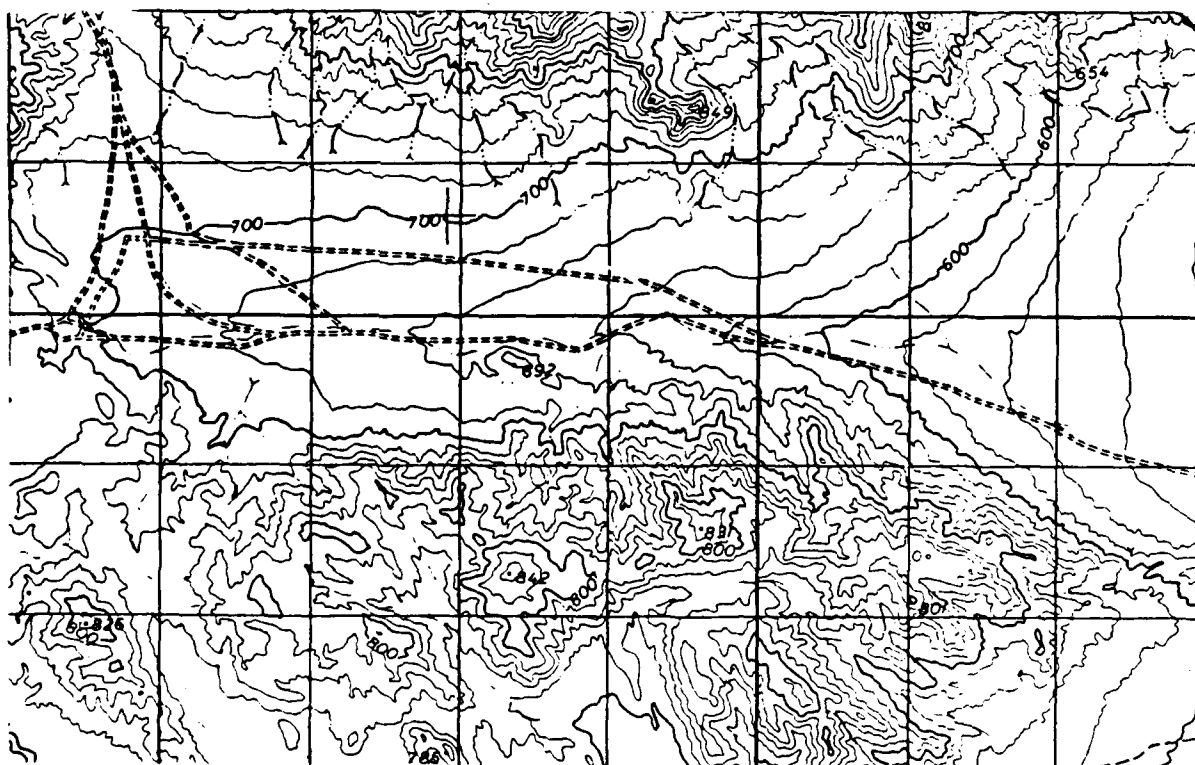
Although every situation is METT-T dependent, the preferred task organization is a light brigade attached to a heavy division. Cross-attaching below this level is only recommended for short, specific missions, because of the LID's austere CSS structure. But the key to heavy-light operations is mutual understanding.

Unfortunately, the Army's doctrine for heavy-light operations is not well developed at all levels, and light infantry employment concepts are not well understood.¹³⁵ Another serious indictment, given today's global realities, is that our doctrine for heavy-light desert operations is almost non-existent. FM 90-3, Desert Operations, does not even address the concept.

The Army's emphasis on modernizing our heavy divisions for a mid-to high-intensity war in Central Europe should be challenged. Heavy forces are required, but we need a more balanced, context-adaptable force overall. And a heavy-light mix is in fact a force that is "...versatile, deployable and lethal." ¹³⁶



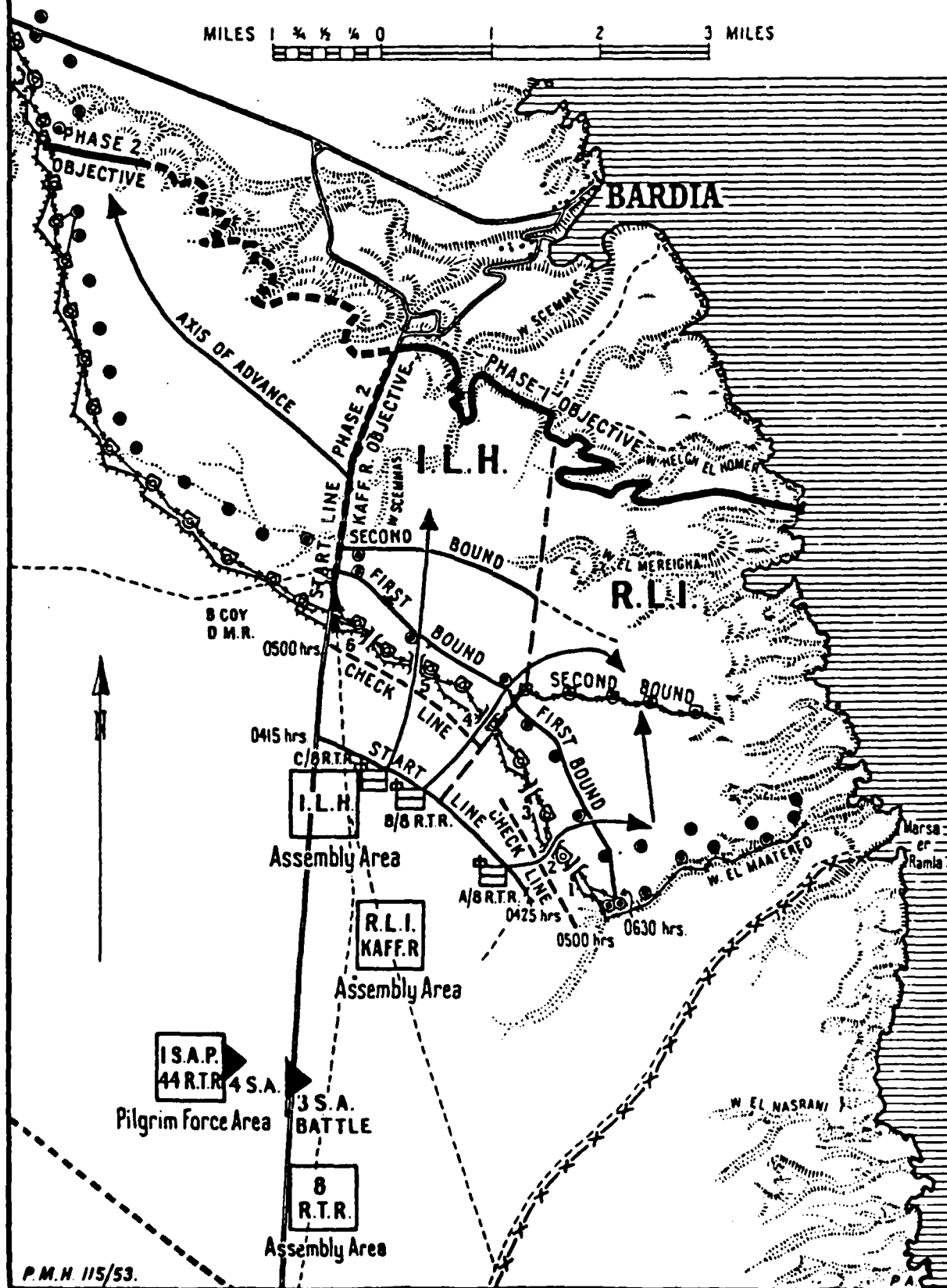
Wadi Kid, Southern Sinai



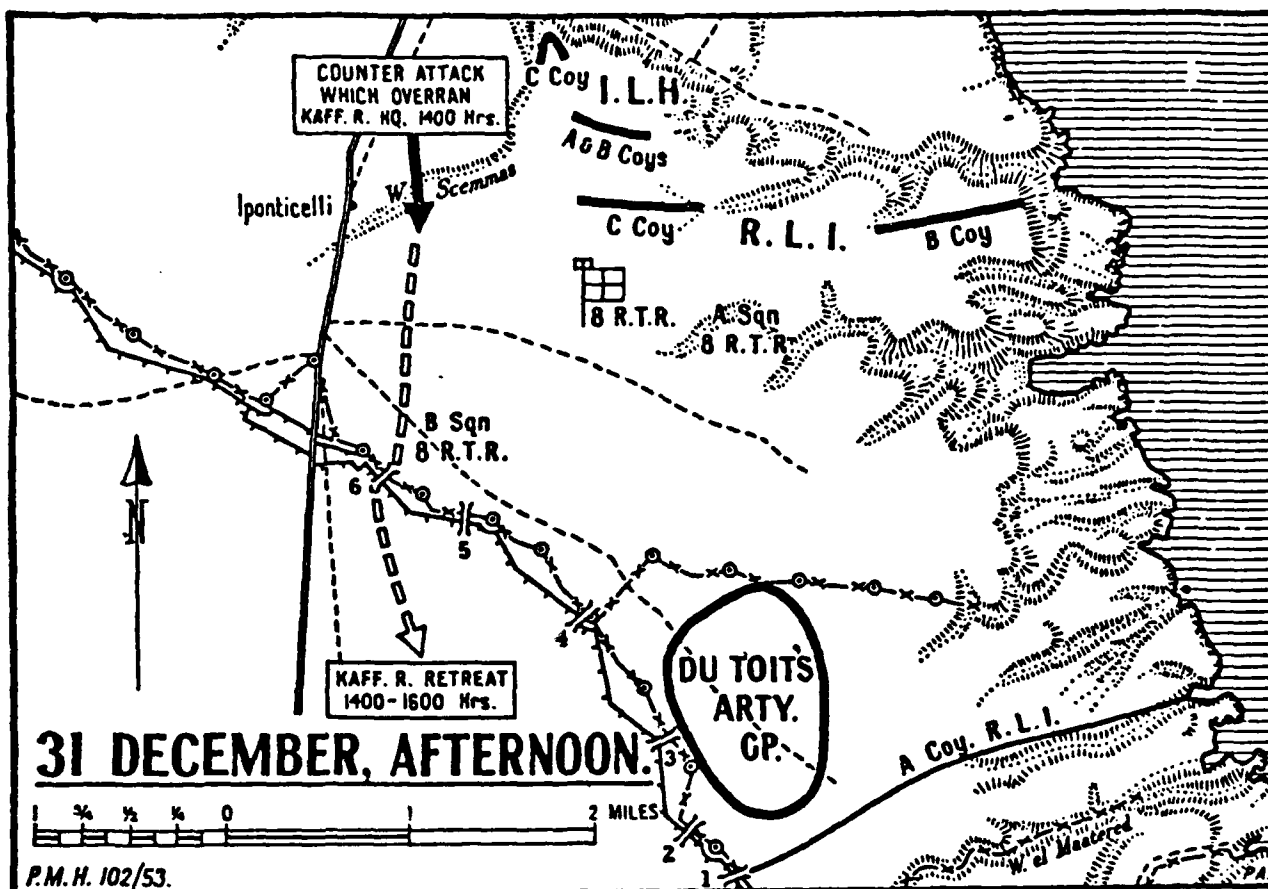
"Valley of Death", Ft. Irwin

MAP A (Reproduced from Fort Irwin MIM South, and Sheet 6181 II; Shora El-Manqata Defense Mapping Agency)

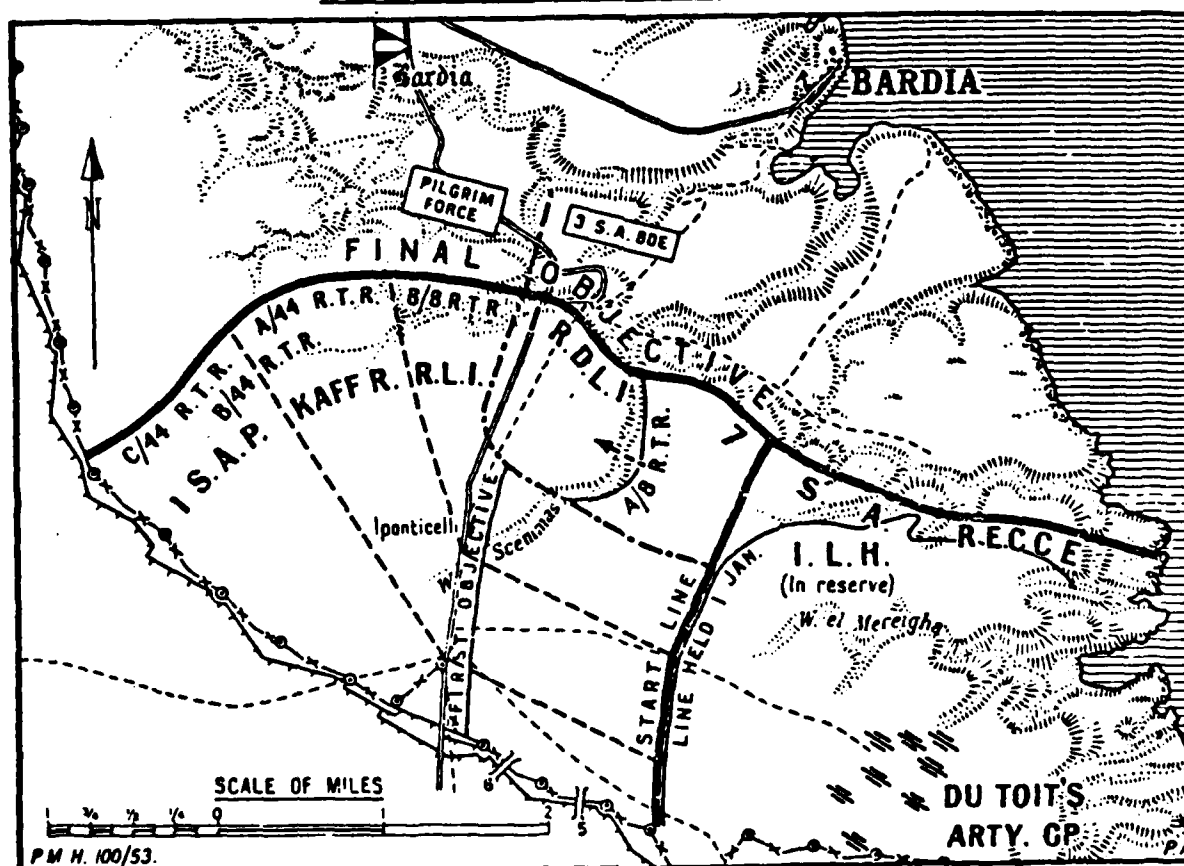
PLAN, PHASES 1 AND 2

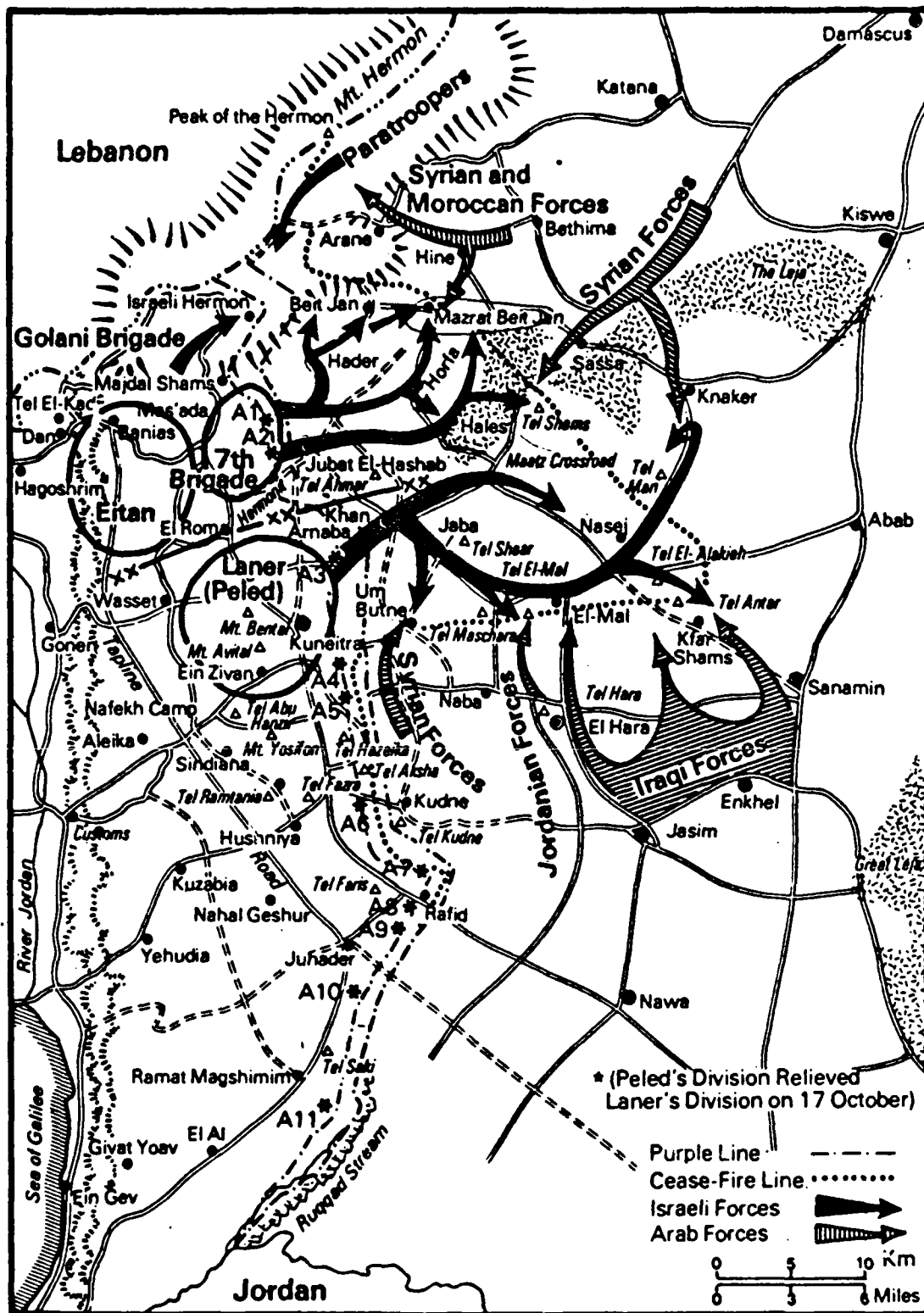


MAP C (Reproduced from War in the Desert, by Neil Orpen, p. 103)



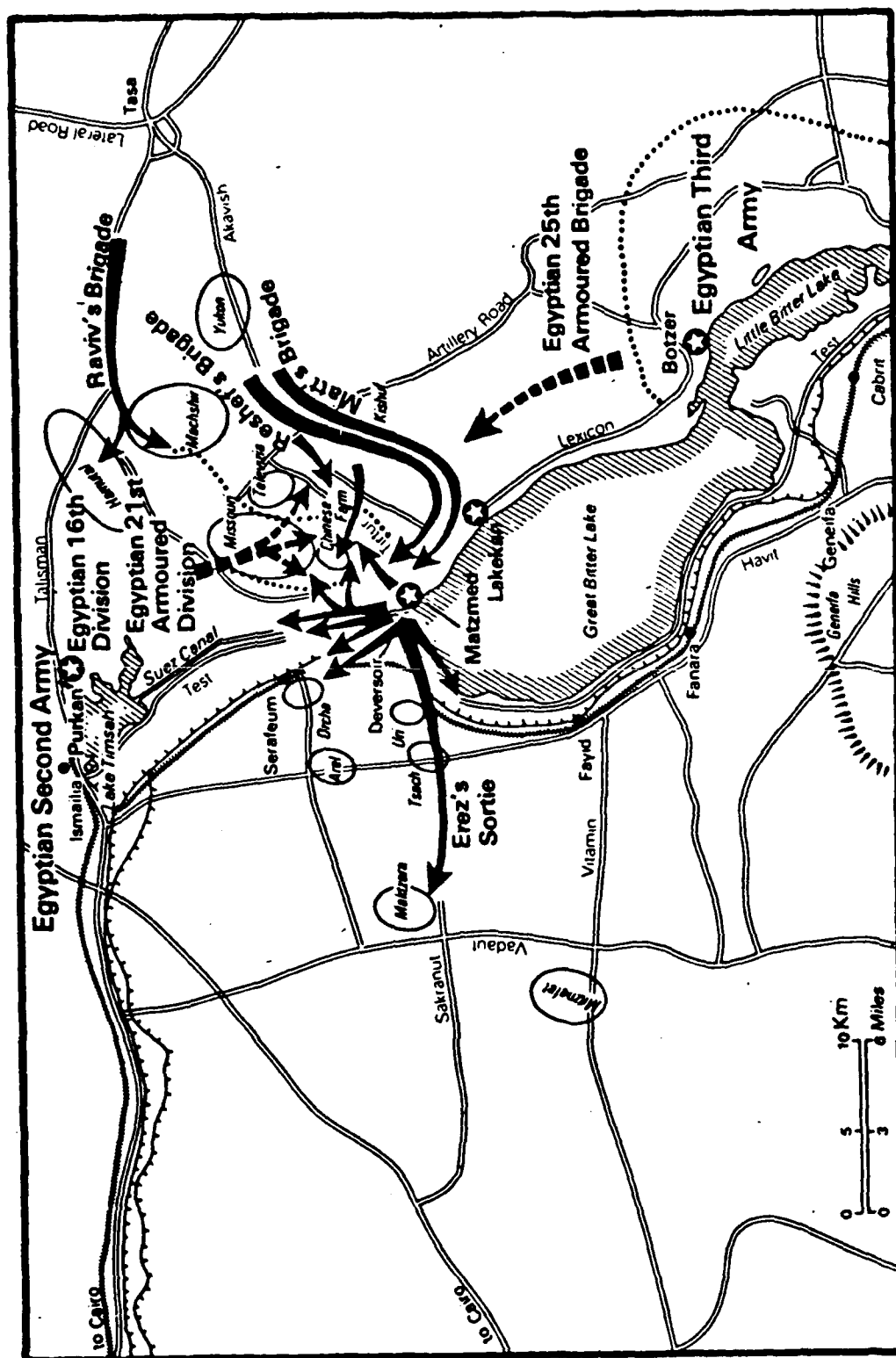
PLAN - NIGHT 1-2 JAN.



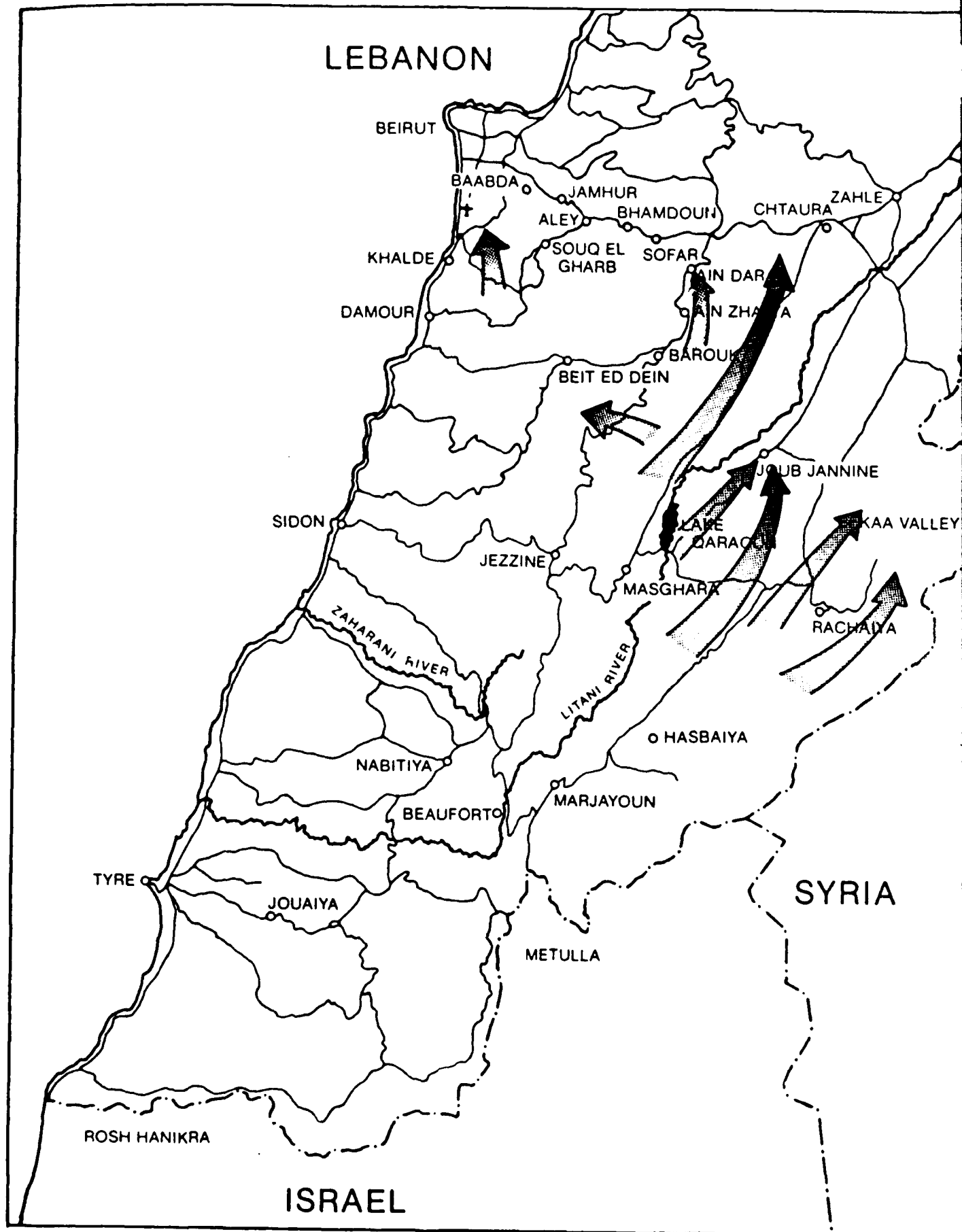


The Breakthrough, 11 October 1973

MAP E (Reproduced from The Arab-Israeli Wars, by Chaim Herzog, p. 295)



The Israeli Crossing, 16 October 1973



MAP G (Reproduced from Operation Peace for Galilee, by Richard A. Gabriel, p. 101)

ENDNOTES

1. General Carl E. Vuono, "Today's U.S. Army: Trained and Ready in an Era of Changes". Army, (October, 1989), p. 29. Hereafter cited as "Today's U.S. Army".
2. Frank C. Carlucci, Annual Report to the Congress, Fiscal Year 1990, (Washington, D.C., 1989) p. 127.
3. John O. Marsh, Jr. and Carl E. Vuono, "The Posture of the United States Army Fiscal Years 1990/91", (Washington, D.C., undated) p. 9.
4. Joint Chiefs of Staff, "United States Military Posture, Fiscal Year 1989", (Washington, D.C., 1988), p. 17.
5. Carlucci, Annual Report to the Congress, p. 127.
6. U.S. Army, "The Army's Long Range Plans for Fielding Light Divisions", Report to the Congress of the United States, (Washington, D.C., April 1985) pp. 2-3.
7. U.S. Army, Field Manual 100-1, The Army, (Washington, D.C., 29 August 1986), p. 19.
8. Headquarters, U.S. Army, XVIII Corps, (DTG 2919557, November 1988), p. 3; I Corps MSG, (DTG 2920307, November 1988), p. 3, SUBJECT: Light Infantry Division (LID) Assessment.

Vuono, "Today's U.S. Army", p. 22.
10. Colonel Huba Wass de Czege, NATO Interim Report: Employment Concepts for Light Infantry in Europe, (SAMS Reprint, U.S. Army Command and General Staff College, 26 August, 1988), p. 4. Hereafter cited as "NATO Interim Report".
11. James B. Motley, "Heavy-Light Forces: Assessing The Challenge", Infantry, (January-February, 1985), p. 13.
12. Vuono, "Today's U.S. Army", p. 14.
13. See Charles A. Kupchan, The Persian Gulf and the West, (Boston, 1987), p. 95; William J. Olson, U.S. Strategic Interest in the Gulf Region, (Boulder, 1987), p. 137; David Segal, "Army Light Infantry: Are They Fit to Fight?", Armed Forces Journal International, (October, 1988), p. 82.
14. Kupchan, The Persian Gulf and the West, p. 109.
15. Kupchan, The Persian Gulf and the West, p. 3.
16. Vuono, "Today's U.S. Army", p. 22.

17. Wass de Czege, "NATO Interim Report", p. 4.
18. Bryan Perrett, Desert Warfare, (Avon, 1988), p. 10.
19. Ibid., p. 9.
20. U.S. Army, Field Manual 90-3, Desert Operations, (Washington, D.C., 19 August 1977), pp. 2-6.
21. Maxwell Orme Johnson, "Rapid Deployment and the Regional Military Challenge: The Persian Gulf Equation", p. 140, in U.S. Strategic Interest in the Gulf Region, ed. William J. Olsen (Boulder, 1987).
22. See Ibid., pp. 2-3; 2-5; U.S. Army, Field Manual 31-25, Desert Operations, (Washington, D.C., 28 January 1964), pp. 5-6.
23. FM 90-3, p. 4-4.
24. NTC "Direct Fire Briefing" slides, undated.
25. Major Scott R. McMichael, "A Historical Perspective on Light Infantry", U.S. Army Command and General Staff College, Combat Studies Institute, Research Survey No. 6, (Fort Leavenworth, KS, September 1987), p. 223. Hereafter cited as "A Historical Perspective on Light Infantry".
26. John Strawson, The Battle for North Africa, (New York, 1969), p. 13.
27. Barrie Pitt, The Crucible of War 2 Auchinleck's Command, (London, 1980), p. 64.
28. Chaim Herzog, The Arab-Israeli Wars, (New York, 1984) p. 136.
29. Jay Luvaas, quote in The Lessons of Recent Wars in the Third World, Volume 1, p. 53, ed. Robert E. Harkavy and Stephanie G. Neuman, (Massachusetts, 1985).
30. Field-Marshal Viscount Slim, Defeat Into Victory, (London, 1956), p. 4.
31. Corelli Barnett, The Desert Generals, (Bloomington, 1986), p. 24; See Michael Carver, Dilemmas of the Desert War, (Indianapolis, 1986), p. 27.
32. Major Benjamin R. Mixon, "Light and Heavy Forces In a Desert Environment: Considerations for Employment in Defensive Operations", (SAMS Monograph, U.S. Army Command and General Staff College, 12 January 1988), pp. 11-13.
33. John A. English, On Infantry, (New York, 1988), p. 124.

34. Pitt, The Crucible of War 2 Auchinleck's Command, p. 192.
35. Ibid., p. 192.
36. Barnett, The Desert Generals, p. 280.
37. Ibid., p. 281.
38. U.S. War Department, Military Intelligence Service Information Bulletin No. 21, The British Capture of Bardia, (Washington, D.C., 25 July 1942), p. 1.
39. Ibid., p. 5.
40. Ibid., p. 11.
41. Neil Orpen, War in the Desert, (Capetown, 1971), p. 84.
42. Ibid., p. 102.
43. Ibid., p. 106.
44. Ibid., p. 105.
45. U.S. War Department, The British Capture of Bardia, pp.14-16.
46. Orpen, War in the Desert, p. 134
47. U.S. War Department, The British Capture of Bardia, p. 22.
48. Edward N. Luttwak and Daniel Horowitz, The Israeli Army, (Cambridge, 1983), p. 161.
49. English, On Infantry, p. 185.
50. Ibid., p. 185.
51. Luttwak and Horowitz, The Israeli Army, pp. 90-92.
52. English, On Infantry, p. 186.
53. Edward N. Luttwak, Historical Analysis and Projection for Army 2000, Vol. 2: Analysis and Conclusions, (TRADOC Contract #DABT 58-82-C-0055, 15 May 1983), p. 13. Hereafter cited as "Army 2000".
54. English, On Infantry, p. 187.
55. Richard E. Simpkin, Race to the Swift, (London, 1985), p. 17.
56. Richard A. Gabriel, Operation Peace for Galilee, (New York, 1984), p. 19.

57. Herzog, The War of Atonement, (Boston, 1975), p. 97.
58. Herzog, The Arab-Israeli Wars, p. 293.
59. Ibid., pp. 294-296.
60. Ibid., p. 297.
61. See Gunther Rothenberg, The Anatomy of the Israeli Army, (New York, 1979), p. 125; Luttwak and Horowitz, The Israeli Army, p. 270.
62. Herzog, The War of Atonement, p. 133.
63. Ibid., pp. 209-211.
64. Ibid., pp. 229-230.
65. Avraham (Bren) Adan, On the Banks of the Suez, (San Francisco, 1980), p. 294.
66. Ibid., p. 339.
67. Anthony E. Cordesman, The Arab-Israeli Military Balance and the Art of Operations, (Landham, Maryland, 1987), p. 48. Hereafter cited as "The Arab-Israeli Military Balance".
68. Richard A. Gabriel, "Lessons of War: The IDF in Lebanon", Military Review, (August 1984), p. 55.
69. Ibid., p. 47.
70. Ibid., pp. 52-53.
71. Cordesman, The Arab-Israeli Military Balance", p. 89.
72. See W. Seth Cyrus, Military Lessons of the 1982 Israel-Syria Conflict, (Lexington, 1985), p. 273, in The Lessons of Recent Wars in the Third World, ed. Robert E. Harkavy and Stephanie G. Neuman (Lexington, Massachusetts, 1985); Gabriel, "Lessons of War", p. 53.
73. Captain James N. Moon, "7th Infantry Division (L), Heavy-Light Study", p. 4. Hereafter cited as "Heavy-Light Study".
74. Majors James M. Dubik and James J. Montano, "FM 100-05: Conceptual Models and Force Design", Military Review, (July 1984), pp. 17-18.
75. U.S. Army, Field Manual 71-100, Division Operations, (Approved Final Draft), (Washington, D.C., 15 November 1988), pp. 1-3.

76. Luttwak, "Army 2000," p. 4.
77. Gabriel, "Lessons of War", p. 53.
78. Lieutenant Colonel Michael H. Hansen and Captain John Carmichael, "The Bradley Advance", in The Mechanized Battlefield, (Washington, D.C., 1985), p. 124., ed. English, John A., J. Addicott and P.J. Kramers.
79. Ibid., p. 129.
80. Steven Zaloga, "Soviet Infantry: Lessons From the War in Afghanistan", Armed Forces Journal International, (October 1989), p. 25.
81. Ibid., p. 25.
82. R. D. Heinl, Jr., ed., Dictionary of Military and Naval Quotations, (Annapolis, 1966), s.v. "Terrain" by Napoleon, p. 324.
83. Headquarters, U.S. Army, Combined Arms Combat Development Activity, "Light Infantry Division White Paper", Undated, p. 18.
84. Ibid., p. 18.
85. McMichael, "A Historical Perspective on Light Infantry", p. 224.
86. Luttwak, "Army 2000", p. 38.
87. Wass de Czege, "NATO Interim Report", p. C-17.
88. Major General James E. Thompson, "Heavy-Light Operations in the Desert", Military Review, (May 1985), pp. 57-58.
89. Herzog, The War of Atonement, p. 258.
90. Segal, "Army Light Infantry Divisions", p. 88.
91. Simpkin, Race to the Swift, p. 73.
92. Ibid., p. 73.
93. Headquarters, U.S. Army Combined Arms Combat Development Activity "Light Infantry Division (LID) Assessment", (Message, ATZL-CAF, 2612507 September 1988).
94. Wass de Czege, "NATO Interim Report", p. C-8.
95. Ibid, p. 7.

96. Ibid., p. C-19.
97. Chris Bellamy, The Future of Land Warfare, (New York, 1987), pp. 182-183.
98. Moon, "Heavy-Light Study", p. 6.
99. Lieutenant General Saad el Shazly, The Crossing of the Suez, (San Francisco, 1980), p. 241.
100. U.S. Army, "NTC Heavy/Light Operations" briefing slides.
101. CACDA message, Light Infantry Division (LID) Assessment,
102. Headquarters, U.S. Army, I Corps, SUBJECT: "Light Infantry Division (LID) Assessment", (Message: 2920307, November 1988), pp. 2-3.
103. Heinl, Dictionary of Military and Naval Quotations, s.v. "Combined Arms" by Jomini, p. 58.
104. Major David L. Poston, Light Infantry Augmentation to Heavy Divisional Forces in Europe: A European Heavy-Light Primer, (MMAS Thesis, U.S. Army Command And General Staff College, 1989), p.97.
105. Ibid., p. 97.
106. Moon, "Heavy-Light Study", p. 25.
107. John Ellis, The Sharp End, (New York, 1980), p. 131.
108. U.S. Army, "NTC Heavy/Light Issues" briefing slides, 1989.
109. U.S. Army, Field Manual 100-5 Operations, (Washington, D.C., 5 May 1986), p. 23.
110. Moon, "Heavy-Light Study", p. 25.
111. FM 100-5, p. 23.
112. U.S. Army Center for Army Tactics, U.S. Army Command and General Staff College, "Heavy/Light Operations" briefing slides, undated.
113. Steven L. Canby, "'Final Report: Classic Light Infantry and New Technology", Contract No. MDA 903-81-C-0207, (1981), p. 70.
114. Lieutenant General John R. Galvin, "Heavy-Light Forces and the NATO Mission", Infantry, (July-August 1984), p. 11.
115. See FM 71-100, Division Operations, p. A-11; CTAC Heavy/Light Operations Briefing.

116. Ibid., pp. 1-4.
117. Wass de Czege, "NATO Interim Report", p. 3.
118. Ibid., p. 3.
119. Center for Army Lessons Learned, "Heavy-Light Lessons Learned", No. 89-2, 22 August 1989, p. 8.
120. Headquarters, U.S. Army, I Corps, "LID Assessment", (November, 1988), pp. 2-3.
121. Poston, Light Infantry Augmentation to Heavy Divisional Forces in Europe: A European Heavy-Light Primer, p. 109.
122. English, On Infantry, p. 125.
123. Wass de Czege, "NATO Interim Report", pp. C/17 - C/19.
124. Brigadier General H.G. Taylor, "NTC Heavy Light Observations, Insights, and Lessons Learned", (Memorandum, 22 June 1988). Hereafter cited as "NTC Heavy Light Observations".
125. Ibid., pp. 6/9 - 6/10.
126. See Ibid., pp. 6/1 - 6/14; "Lessons Learned During a Heavy-Light Infantry Rotation, by Task Force 3/9 Infantry at the National Training Center".
127. Taylor, "NTC Heavy Light Observations", p. 6-4.
128. Lessons Learned During A Heavy/Light Infantry Rotation by Task Force 3-9 Infantry at the National Training Center, (Fort Irwin, CA, undated), p. 37.
129. Ibid.
130. Taylor, "NTC Heavy Light Observations", p. 6-3.
131. Ibid., pp. 6-6 to 6-7.
132. U.S. Army, "NTC Heavy/Light Operations" briefing, p. 35.
133. Ibid., p. 39.
134. Lessons Learned During A Heavy/Light Infantry Rotation by Task Force 3-9 Infantry at the National Training Center, (Fort Irwin, CA, undated).
135. Wass de Czege, "NATO Interim Report", p. 8.
136. Vuono, "Today's U.S. Army", p. 29.

Selected Bibliography

Books

- Adan, Avraham (Bren). On The Banks of the Suez. San Francisco: Presidio Press, 1980.
- Barnett, Corelli. The Desert Generals. Bloomington: Indiana University Press, 1986.
- Bellamy, Chris. The Future of Land Warfare. New York: Saint Martins Press, 1987.
- Carver, Michael. Dilemmas of the Desert War. Indianapolis: Indiana University Press, 1986.
- Cordesman, Anthony H. The Arab-Israeli Military Balance and the Art of Operations. Lanham, MD: Univ. Press of America, 1987.
- Ellis, John. The Sharp End. New York: Charles Scribner's Sons, 1980.
- English, John A. On Infantry. New York: Praeger, 1988.
- _____, ed. J. Addicott, P. J. Kramers. The Mechanized Battlefield. Washington, DC: Pergamon-Brassey's International Defense Publishers, 1985.
- Gabriel, Richard A. Operation Peace for Galilee. New York: Hill and Wang, 1984.
- Heinl, Jr., R. D., ed., Dictionary of Military and Naval Quotations. Annapolis: U.S. Naval Institute, 1966.
- Herzog, Chaim. The Arab-Israeli Wars. New York: Vintage Books, 1984.
- _____. The War of Atonement. Boston: Little, Brown & Co., 1975.
- Kupchan, Charles A. The Persian Gulf and the West. Boston: Allen & Unwin Inc., 1987.
- Lawrence, T.E. Seven Pillars of Wisdom. New York: Penguin, 1963.
- Luttwak, Edward N. and Daniel Horowitz. The Israeli Army. Cambridge: University Press of America, Inc., 1983.
- Olson, William J., ed. with Maxwell Orme Johnson. U.S. Strategic Interests in the Gulf Region. Boulder: Westview Press, 1987.
- Orpen, Neil. War in the Desert. Capetown: Purnell & Sons, 1971.

- Pitt, Barrie. The Crucible of War 2 - Auchinleck's Command. London: Papermac, 1980.
- Perrett, Bryan. Desert Warfare. Avon: Patrick Stephens Limited, 1988.
- Rothenberg, Gunther. The Anatomy of the Israeli Army. New York: Hippocrene Books, Inc., 1979.
- Schiff, Ze'ev. A History of the Israeli Army. New York: Macmillan, 1985.
- Shazly, Lieutenant General Saad el. The Crossing of the Suez. San Francisco: American Mid-East Research, 1980.
- Simpkin, Richard E. Mechanized Infantry. London: Brassey's Defence Publishers, 1983.
- _____. Race to the Swift. London: Brassey's Defence Publishers, 1985.
- Slim, Field-Marshal Viscount. Defeat Into Victory. London: Papermac, 1956.
- Strawson, John. The Battle for North Africa. New York: Charles Scribner's Sons, 1969.

MANUALS

- Field Manual 31-25, Desert Operations. Washington, DC: HQ Department of the Army, 1964.
- Field Manual 71-100. Division Operations. Washington, DC: HQ Department of the Army, 1988.
- Field Manual 90-3, Desert Operations. Washington, DC: HQ Department of the Army, 1977.
- Field Manual 100-1 The Army. Washington, DC: HQ Department of the Army, 1986.
- Field Manual 100-5 Operations. Washington, DC: HQ Department of the Army, 1986.

ARTICLES AND PERIODICALS

- Dubik, Major James N. and Major James J. Montano. "FM 100-05: Conceptual Models and Force Design," Military Review. July, 1984, pp. 16-26.
- Gabriel, Richard A. "Lessons of War: The IDF in Lebanon," Military Review. August, 1984, p. 47-65.

Galvin, Lieutenant General John R. "Heavy-Light Forces and the NATO Mission," Infantry. July-August, 1984, p. 11.

_____. "The Heavy-Light Concept," Armed Forces Journal International. July, 1982.

Hamilton, Major Michael A. "Heavy-Light Operations," Infantry. September-October, 1989, pp. 22-26.

Harned, Major Glenn M. "It will take a Balanced Force to Win Future Wars," Army Times, 6 November, 1989.

Hollingsworth, James F. "The Light Division," Armed Forces Journal International. October, 1983.

Motley, James B. "Heavy-Light Forces: Assessing The Challenge," Infantry. January-February, 1985, p. 13.

Record, Jeffrey. "It is time for the Pentagon to shift its focus from the 'Big War' in Europe," The Kansas City Times, 25 November 1989, p. A-23.

Segal, David. "Army Light Infantry: Are They Fit to Fight?" Armed Forces Journal International. October, 1988, p. 82.

Thompson, Major General James E. "Heavy-Light Operations in the Desert," Military Review. May 1985, pp. 57-58.

Vuono, General Carl E. "Today's U.S. Army: Trained and Ready in an Era of Changes," ARMY. October, 1989, p. 29.

Wass de Czege, Huba. "Three Kinds of Infantry," Infantry. July-August, 1985.

Zaloga, Steven. "Soviet Infantry: Lessons From the War in Afghanistan," Armed Forces Journal International. October 1988, p. 25.

DOCUMENTS

Canby, Steven L. "Classic Light Infantry and New Technology." Arlington, VA: Study for Defense Advanced Research Project Agency, 1981.

Carlucci, Frank C. "Annual Report to the Congress." 1988

Luttwak, Dr. Edward N., "An Historical Analysis and Projection for Army 2000. Volume 2: Analysis and Conclusions." Chevy Chase, MD; E.N. Luttwak, Inc. Contract No. DABT58-82-C-0055 (15 May 1983).

- McMichael, Scott R. "A Historical Perspective on Light Infantry." Fort Leavenworth, KS: Combat Studies Institute Research Survey No. 6, September, 1987.
- Mixon, Benjamin R. "Light and Heavy Forces In a Desert Environment: Considerations for Employment in Defensive Operations," Monograph, Fort Leavenworth, KS: 1988.
- Moon, James N. "7th Infantry Division (L), Heavy-Light Study." Unpublished paper, Fort Ord, CA: undated.
- Poston, David Lee. "Light Infantry Augmentation to Heavy Divisional Forces in Europe: A Heavy-Light Primer." MMAS Thesis, Fort Leavenworth, KS: 1989.
- U.S. Department of the Army. National Training Center, "Direct Fire Briefing." Unpublished slides, undated.
- U.S. Department of the Army. Combined Arms Combat Development Activity, "Light Infantry Division White Paper." Unpublished paper, Fort Leavenworth, KS: undated.
- U.S. Department of the Army. National Training Center, "NTC Heavy/Light Issues." Unpublished slides, undated.
- U.S. Department of the Army. Center for Army Tactics, "Heavy/Light Operations." Unpublished slides, U.S. Army Command & General Staff College, Fort Leavenworth, KS: undated.
- U.S. Department of the Army. Center for Army Lessons Learned "Heavy-Light Lessons Learned." Bulletin #89-2, Fort Leavenworth, KS: 22 August 1989.
- U.S. Department of the Army. National Training Center, "NTC Heavy/Light Observations, Insights, and Lessons Learned." Memorandum, Fort Irwin, CA: 22 June 1988.
- U.S. Department of the Army. Headquarters, I Corps, "Light Infantry Division (LID) Assessment." Message, Fort Lewis, WA: DTG 292030Z November 1988.
- U.S. Department of the Army. Headquarters, XVIIIth Airborne Corps, "Light Infantry Division (LID) Assessment." Message, Fort Bragg, NC: DTG 291955Z November 1988.
- U.S. Department of the Army. Headquarters, 1st Brigade, 1st Infantry Division (M), "Heavy/Light Operations during NTC Rotation 88-6." Memorandum, Fort Riley, KS: 1 April 1988.

U.S. Department of the Army. Headquarters, 1st Brigade, 7th Infantry Division (L), "Lessons Learned During a Heavy-Light Infantry Rotation by Task Force 3-9 Infantry at the National Training Center." Unpublished slides, Fort Ord, CA: undated.

U.S. War Department, Military Intelligence Service Information Bulletin No. 21, The British Capture of Bardia, Washington, DC: 1942.

Wass de Czege, Huba. "NATO Interim Report: Employment Concepts for Light Infantry in Europe." School of Advanced Military Studies Reprint, Fort Leavenworth, KS: 1988.